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GENERAL NOTE

Owing to the current nature of the investigations mentioned in the Technical News Bulletin, sometimes it will be impossible to supply printed information regarding them. However, in these cases, when the investigation has progressed sufficiently far, the Bureau will be pleased to furnish technical data to those engaged in the particular application of the subject, in order to avoid the delay incident to publication.

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1 Nick-Bend Test for Wrought Iron

All of the laboratory work in connection with this investigation has been completed, and the report is being assembled for publication. The general conclusions which the results appear to warrant are given below: Crystalline areas appear most readily in the fractures obtained in the nick-bend test of those wrought irons in which the individual slag threads are small and uniformly distributed. The presence of "steel" in wrought iron, since it is conducive to this condition, favors the formation of such crystalline areas. The converse, however, is not true.

A crystalline area in the fracture is not a sure indication of the presence of "steel" in such wrought iron. The test cannot be used as a means for detecting high-phosphorus iron. A rapid application of the load in the nick-bend test, usually by impact, is necessary for the formation of the crystalline areas. Distinction should be made between the crystalline areas on the tension and on the compression sides of the tested bar. The latter, in general, are not to be regarded as indicative of the structural condition of the metal.

2 Effect of Cold-Rolling on the Hardness of Metals

This work, which has been previously mentioned in the Bulletin, is being continued. The general character of the results obtained show that the change in hardness resulting from cold working is represented by the V-curve, the abscissae of which show the degree of cold working, and the ordinates, the softness of the metal. The only possible exception found so far is aluminum of very high purity. The results obtained for a specimen of this material indicated a progressive hardening upon increasing deformation. Tin, on the other hand, gave the usual V-curve. Additional tests are being made with the "soft" metals, aluminum and tin; care being taken that the metals are tested immediately after rolling so that the chance for self-annealing is eliminated. It is also intended to make density determinations of several typical metals after various degrees of cold deformation.

3 Invar and Related Steels

Circular 58 of the Bureau of Standards on Invar and Related Steels, has recently been revised, and the second edition can be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 30¢ a copy.

This circular is mainly a compilation of data obtained during the last 30 years by various investigators on the different properties of nickel steels. Particular attention is given to "invar," a nickel-iron alloy containing about 36% nickel and possessing an extremely small thermal expansivity at ordinary temperatures, the mean coefficient of linear expansion between 0 and 40°C. being of the order of 1 to 2 millionths. The results of investigations made on the various properties of the nickel-iron alloy series have been presented largely in diagrammatic and tabular form.

Following an historical account of the development of nickel steel and studies of their properties, the nature of the anomalies in behavior met with in these steels and characterized by their irreversible and reversible phenomena are discussed in the light of results obtained on their various physical properties. The constitution and microstructure of these alloys are first dealt with, and next the rather extensive studies made on the magnetic properties. A magnetic transformation (Curie points) diagram has been plotted from the observations obtained magnetically, for the most part, by various investigators.

4 Cast Iron for Enameling Purposes

The Bureau has received a number of specimens of typical enameling castings, and these are now being enameled with several commercial cast iron enamels. The chemical analysis of the castings has been made, and the Bureau also plans to make up typical bodies of cast iron in its

metallurgical division. The specimens thus obtained will also be analyzed chemically and enameled. An attempt will be made to correlate the blistering of the enamel and the chemical composition of the cast iron, with the object of obtaining a good commercial cast iron which will not produce blisters.

5 Mechanical Analysis of Foundry Sand

A mechanical analysis was recently made, using the air analyzer of the Bureau, of a sample of foundry sand which contained coal particles and coal dust. This sand had been sent with a request for some method of removing the coal so that the sand could be used again in the foundry. The results of the mechanical analysis indicated that the coal could not be effectively cleaned out of the sand by means of air separation. It is probable that in cases of this kind some method of washing must be used.

6 How to Make Lime Set Quickly

Some months ago, the Bureau of Standards developed a quick-setting lime composed of 1 volume of ground quicklime and 2 volumes of hydrate. The commercial success of this material depends upon finding some way to make it keep during shipment, or else to make it into finished form at the factory. Working on this latter phase of the subject, the Bureau has been developing a cast lime partition tile. Experiments have shown the best composition to be 1 volume of wood fiber, 5 of quicklime, and 10 of hydrate; and that the best curing condition is outdoors exposed to the weather. Such a block sets so that it can be removed from the mold in 10 minutes, can be handled in 20 minutes, can be sawed and nailed, and has a compressive strength of 100 lb. per square inch at 7 days. It is about 20% heavier than gypsum tile of the same size, and experiments are now being conducted to see if the core volume can be increased without too great a sacrifice of strength.

7 Recommended Specification for Quicklime for Use in Causticising

Circular 143 of the Bureau of Standards, which can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5¢ a copy, is devoted to recommended specifications for quicklime for use in causticizing. The manufacture of caustic alkali consumes a large tonnage of quicklime annually, and for this purpose a very pure grade of lime is required.

Purity is determined not by the total content of calcium oxide, but rather by the content of calcium oxide which is available in the process for which the lime is used. A careful study of the requirements of the users of the quality of lime which is actually being used and of the possibilities of production have led to the estimation of 85% as a fair standard for available lime. Unlike most

materials which are bought on specification, chemical lime is more valuable if it has a higher degree of purity than that required by the standard, and less valuable if it has a lower degree.

For this reason the Bureau has recommended that a bonus and penalty clause be inserted in the contract in order to take care of the variations from the 85%. While the material is less valuable but still can be used if the purity falls below the standard, there is a point reached eventually when the material is of so little value that it is poor economy to use the lime for this purpose. A careful survey of the situation has led the Bureau to place this figure at 70%.

In this work, assistance has been rendered by an Interdepartmental Conference on Chemical Lime, composed of representatives of many Government agencies, and the specifications have been partially approved by the National Lime Association, representing the producers, and by the technical association of the pulp and paper industry representing the largest group of consumers of this class of lime.

8 Recommended Specification for Limestone and Quicklime for Use in the Manufacture of Sulphite Pulp

Sulphite pulp, which is a material used in paper-making, is made from wood cooked with a solution of calcium bisulphite. This solution may be prepared in two ways, either by permitting sulphur dioxide to pass upward through a tower filled with limestone and allowing water to trickle down over the stone, or by passing the sulphur dioxide through milk of lime contained in a tank. In the former process, high-calcium limestone is preferred, because limestone containing much magnesium carbonate is not dissolved uniformly and is thus apt to fall to pieces and stop the circulation. In the latter process, a high-calcium quicklime is preferred for the manufacture of the milk of lime, because the magnesia is more soluble than the lime in the sulphur dioxide solution and a liquor having higher strength can thus be prepared. It is quite possible, however, to use a high-magnesium stone in the tower process or a high-calcium lime in the milk-of-lime process. The specifications, therefore, cover both high-calcium and high-magnesium limestone and quicklime on the basis of about 95% purity.

This publication is Bureau of Standards Circular No. 144 and can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5¢ a copy.

9 Study of Architectural Properties of Terra Cotta

During the past month 110 balusters and 68 coping blocks, burned in commercial kilns, were forwarded to the Bureau for test and have been set in mortar and exposed for weathering. A duplicate set is being saturated with paraffine and will also be subjected to the weathering tests. Absorption is being determined on balusters, and tests for this property, as well as for transverse

strength, have been made on specially-prepared bars representing five bodies used in the manufacture of terra cotta. The data thus secured will be correlated with the heat treatment which the respective pieces receive in burning.

10 Investigation of Potters' Flint Including the Effect of Kryptocrystalline Flint in Pottery Bodies

Eight sanitary ware bodies made with flint under investigation by the Bureau have been burned and tested for transverse strength, porosity, and resistance to quenching. The porosity and strength of the bars varied considerably, indicating the need of a longer soaking period in finishing these burns, and for this reason the work will be repeated.

The strengths of the fired bodies did not show a regular variation according to type of flint used, such as was found in the case of vitreous china. The work, therefore, needs to be checked, and additional samples of flint have been requested from the producers.

In connection with the porosity determination, various methods and periods of soaking have been tried in order to show their relation to the method used in this investigation. A few experiments on drying the saturated pieces have also been carried out. Quenching tests made from 200°C. to water at 30°C. confirm previous indications that bodies made with the kryptocrystalline type of flint are more resistant to failure than those made with sand or rock quartz.

11 Standard Specifications for Whiteware Pottery

A committee of the Vitrified Chinaware Manufacturers met with the Committee on Chinaware and Glassware of the Federal Specifications Board on July 10 and three sets of chinaware were agreed upon, viz: (1) 1/2 thick vitrified chinaware for enlisted men's dining service as used by the Army, Navy, and Marine Corps; (2) vitrified hotel chinaware for all government dining service and hospital service, where desired; (3) 1/4 thick vitrified chinaware for hospital service. Drawings of the different articles are now being made so that each purchasing department and manufacturer can be supplied with a set of blueprints.

12 Physical Properties of Clay Bodies as Affected by Drying Treatment

Tests have been made upon the physical properties of various clays and body compositions to determine the effect of drying treatment. Some of this work is being carried out in cooperation with the investigation of the effect of various potters' flint in semi-porcelain bodies. In this way drying effects are being traced from the plastic to the burned state, and the effect upon the drying behavior of variation in the body composition is noted.

Observations are being made to determine the effect of gravity upon the uniformity of drying and shrinkage in large commercial pieces. It is expected that it will be

possible to establish a set of standard laboratory drying tests, similar to the firing tests now used, and from these the ideal drying treatment and resulting effects may be reported for any clay or body which may be submitted to the Bureau for examination.

13 Plasticities of Clay

Work is in progress on the development of a penetration type of plastometer to be substituted for the capillary tube plastometer. The latter form is not applicable to very stiff paste or bodies, such as those used by potters in the molding of forms, but is used in the study of clay slips employed in the casting process, but not the study of the molding range.

With the capillary tube plastometer, the shearing stress is varied by changing the total pressure acting on the material, while in the penetration type, the shearing stress is varied by changing the pressure of the penetration rod.

14 Specifications for Leather

The leather section of the Bureau has completed a final draft of specifications covering rawhide for vegetable-tanned sole leather. These were prepared for presentation to the subcommittee on leather of the Federal Specifications Board. The approval of the Tanners' Council committee has been secured, and an initial draft of specifications for three grades of upholstery leather has also been prepared. The data upon which these specifications are based have been prepared from an investigation which has just been completed upon upholstery leather samples submitted by automobile manufacturers.

15 Machine for Determining the Wearing Qualities of Sole Leather

The Bureau of Standards has recently constructed a new abrasion machine for determing the wearing qualities of sole leather. This machine carries a wheel on which garnet paper is placed, and it is the rubbing of the samples of leather against this paper which causes the wear. This paper will be renewed after each test, and it is hoped in this way to avoid the change of wear noted with abrasive wheels.

16 Tests of Tires Made from Reclaimed Rubber

The Bureau of Standards has placed an order with one of the rubber companies for the making of 50 tires using various amounts of reclaimed rubber in the treads. After manufacture, these tires are to be tested in the laboratory and also on trucks of the Post Office Department over four different types of roads, so that the relative wear of the different compounds can be determined.

17 Accuracy of Analytical Weights

An instance of sustained accuracy in the weights which are now being submitted to the Bureau of Standards for test was noticed during the past month. In a shipment of

9 sets, containing a total of 216 weights, all were within the required accuracy. Only once before has a larger number of sets been submitted without some of the weights having errors greater than the prescribed tolerances. The fact that such shipments are now received, even if only occasionally, is an encouraging indication of the good work done by some American makers.

18 Fitting of Plugs for Class B Weights

The Bureau of Standards has recently issued, as one of its mimeographed circulars, Letter Circular 91 on "Fitting of Plugs for Class B Weights." This circular has been issued largely to encourage the manufacture of the reliable type of weights admitted for test under Class B. It gives in detail a test for the degree of air-tightness required of the adjusting plugs allowed on such weights. This test consists of covering the plug with water, reducing the air pressure by 1/5 of its value, and noting whether there is a gain in weight after returning the air pressure to its original value.

19 Necessity for Placing the Name of the Country of Origin on Imported Articles

In testing a number of sets of weights recently, the Bureau found that these contained tweezers on which the word "Germany" had been nearly obliterated by stamping over it the American name of the maker of the weights. This is contrary to the law requiring imported articles to be marked with the name of the country of origin and which provides a penalty not to exceed $5,000 or imprisonment not exceeding one year, or both. Importers should bear these facts in mind when marketing such articles in the United States.

20 Revision of Circular on Standards for Electric Service

Several meetings have been held during the past month to discuss the revision of Circular 56 of the Bureau of Standards on Standards for Electric Service. The Bureau has had the benefit of criticism by members of a committee representing the National Electric Light Association and the Association of Edison Illuminating Companies. A final meeting was held in New York on July 19, and all points have been mutually agreed upon. A new edition of the circular will undoubtedly have the full endorsement of the organizations representing the electric light and power industry.

21 Electrolysis Investigations

During the past month final revisions have been made of the reports of work carried out during the Spring on the properties of the Humble Pipe Line Company and in the city of Galveston. A report on the Humble Pipe Line Company survey has been submitted to the utilities concerned, and the Galveston report will very soon be sent out in mimeographed form.

Arrangements have been made with the utilities in Tulsa, Okla., and in St. Louis, Mo., for electrolysis investigations to be carried on in those cities with special reference to the pipe drainage method of electrolysis mitigation. The work in Tulsa was started about the first of August, and the St. Louis investigation will be commenced as soon as the Tulsa survey is completed.

The Bureau has assisted during the month in an attempt to solve the electrolysis problem in the city of Wilmington, Dela. This situation has caused considerable difficulty to the public utilities for a number of years. Some further tests have been planned there, and arrangements made for carrying them out in cooperation with the Bureau.

22 Line Radio Communication

A publication giving an introduction to the subject of line radio communication has recently been prepared under the direction of the Chief Signal Officer of the Army with the cooperation of the Bureau of Standards. This pamphlet gives an explanation of how messages are carried to distant points by radio frequency currents directed over ordinary telephone lines or power wires. The fundamental principles of radio and its relation to line radio telegraphy and telephony are discussed. This pamphlet, Signal Corps Radio Communication Pamphlet No. 41, entitled, "Introduction to Line Radio Communication," can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10¢ a copy.

23 Measurements of Voltage Amplification of Audio Frequency Amplifiers

Letter Circular 98, one of the mimeographed series of the Bureau of Standards, entitled, "Some Measurements of Voltage Amplification of Audio Frequency Amplifiers," has just been issued. This circular gives the results of voltage amplification measurements made on 16 audio frequency amplifiers which were on the market during 1921-22. All these amplifiers employed transformer coupling. Measurements were made over a frequency range of 400 to 2100 cycles per second. The amplifiers studied are referred to by arbitrary reference numbers rather than by a statement of the manufacturers' names and model number, the method followed being the same as that in connection with Letter Circular 86 on "Methods of Measuring Voltage Amplification of Amplifiers."

It is believed that the examples given in this report will be of assistance to manufacturers in testing and describing their own products and will thus lead to their improvement. A limited supply of these circulars is available and may be obtained by addressing the radio section of the Bureau of Standards.

24 Spectroscopic Alternations of the Chemical Elements

One of the important achievements of the optics division of the Bureau has been its recent tests of the spectroscopic alternation law across the entire periodic system of chemical elements. This work involved the analysis of complex arc spectra of elements appearing in columns IV to VIII of the periodic table. For some time work has been in progress on the arc spectra of titanium, vanadium, chromium, and iron which occupy columns IV, V, VI, and VIII, respectively, and in which no significant regularities had heretofore been detected. The structure of the chromium spectrum was reported some months ago. A paper on the regularities in the arc spectrum of iron was published the end of June, and similar work on platinum appeared in July, and a successful analysis of the vanadium spectrum has just been sent to press. These results prove for the first time that the structures of arc spectra alternate from even to odd groups throughout the system of chemical elements. Satisfactory progress has been made in connection with similar work on the arc spectra of platinum, nickel, cobalt, and scandium.

25 Method for Making the Interior of Automobiles More Comfortable in Hot Weather

Attention has been called previously to a simple means for decreasing the heat radiated through a tent or other light covering which is exposed to the sun. By coating the under side of the tent cloth with aluminum paint, the heat radiated from the under side is reduced by 86%. Painting the outside with aluminum paint was found to be slightly less efficient, the heat radiated from the under side being reduced only about 80%.

Coverings of conveyances, such as, for example, the tops of automobiles, ice wagons, etc., consist of cloth, the outside of which is often painted with a black composition which absorbs perhaps 90% of the sun's rays. Practically half of this is reradiated from the under side of the cloth. Tests are in progress at the Bureau of Standards which show that a coating of aluminum paint applied either to the outside or inside of such tops reduces by 50 to 60% the intensity of the heat radiated from the under side into the interior of the conveyance.

26 A Means for Increasing the Efficiency of Radiators

For esthetic reasons, and also because it has become a custom, the radiators employed in heating buildings are usually painted with aluminum or bronze paint. From the viewpoint of obtaining the maximum amount of heat from a radiator of a given size, this is one of the most inefficient paints that can be applied. Tests in progress at the Bureau of Standards on the emissivity of sheet iron covered with white paint, enamel, and aluminum paint show that the aluminum paint emits only 27 to 30% as much as a nonmetallic paint or enamel. It has been known for sometime that

aluminum paint is not so good a radiator as a nonmetallic paint, some published data indicating that the emissivity of aluminum paint was about 75% that of a nonmetallic paint, such as iron oxide. With increase in age and other deterioration, the surfaces used in the present test would increase in emissivity, but it is evident that for efficient service we should educate ourselves so as to become accustomed to the use of nonmetallic paints, such as the oxides of iron, chromium, white paint, etc., for metal radiators.

27 Dictionary of Specifications

Work has been started at the Bureau of Standards on the compilation of material for a dictionary or handbook of specifications for supplies purchased by Federal, State, and Municipal governments and public institutions. This work grew out of a meeting held in May, 1923, of State Purchasing Agents from all over the country, and at which the cooperation of the various states was assured in this matter.

On July 11, a conference was held of various national organizations interested in the preparation and unification of purchase specifications and in their use from the point of view of both the producer and the consumer. This conference was called for the purpose of organizing an advisory committee to cooperate with the Department of Commerce and the National Conference of State Purchasing Agents in the work of formulating purchase standards, specifications, and tests. Although no meeting of this advisory committee has yet been held, the various organizations represented are cooperating actively in the actual work of compiling the material for the dictionary, and a great deal of information has been supplied.

Correspondence conducted with the officers of trade associations and the purchasing agents of a large number of municipalities and public institutions has established the fact that all the individuals and groups for which the dictionary of specifications is being prepared will welcome its appearance enthusiastically and cooperate actively in the preparation.

A collection is now being made of all available specifications prepared by the various departments and independent establishments of the Federal government and those used by State and Municipal governments, public institutions, and the important national trade associations, and technical societies. These specifications are being thoroughly card-indexed and classified. Care is being taken to pick out those specifications which are most urgently needed, and due consideration is being given to the attitude of purchasers and consumers toward the existing and the proposed specifications.

Respectfully,

George K. Burgess, Director
HGB